National Semiconductor

TDA440 Video IF Amplifier

General Description

The integrated circuit has the following functions incorporated: 3 symmetrical IF (broad band) amplifier with first and second regulated stages, controlled color carrier demodulator; video post-amplifier with low pass response and output independent of supply fluctuations; gated AGC section for the IF amplifier; delayed regulated output voltage for the tuner pre-stage.

Features

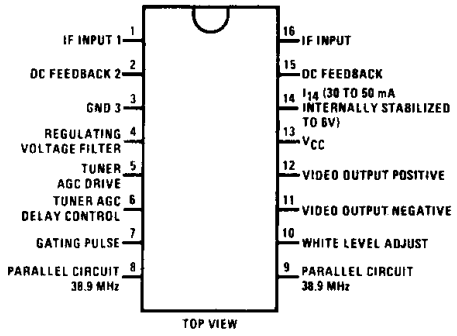
- High gain – high stability
- Constant input impedance indepedent of AGC
- Poor noise increase due to AGC action
- Negative video signal hardly affected by supply voltage variations
- Minimum RF breakthrough to video outputs
- Fast AGC action – gating largely independent of pulse shape and amplitude
- Very low intermodulation products
- Minimum differential error
- Positive as well as negative video signal available from low impedance outputs
- Integrated temperature compensating circuit
- DC output component adjustable (peak white)

Applications

- Video IF amplifier for color and monochrome television receivers

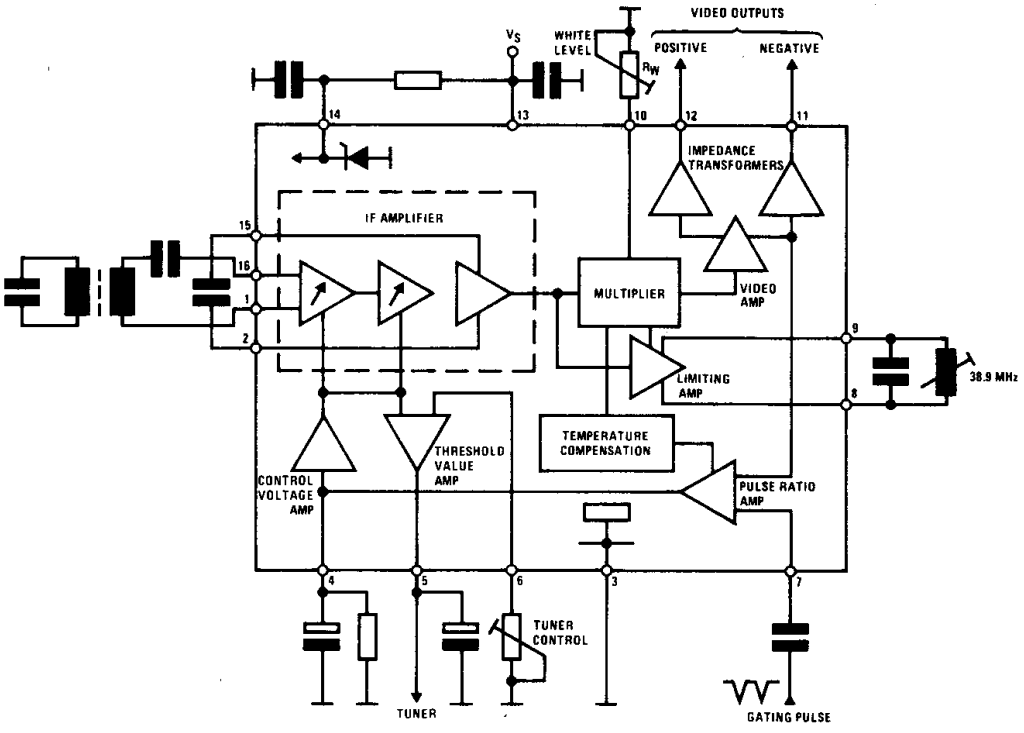
Connection and Block Diagrams

Dual-In-Line Package



Dual-In-Line Package, Order Number TDA440
See NS Package N16A

Quad-In-Line Package, Order Number TDA440Q
See NS Package N16C



Absolute Maximum Ratings

V_S, Supply Voltage Range (Pin 13)	10 to 15V	V_{EXT}, External Voltage (Pin 4)	3.2V
I_S, Supply Current of Low Voltage Stabilizer (Pin 14)	50 mA	Power Dissipation	
V_Q, Open Loop Voltage (Pin 5)	15V	P_{TOT}, $T_A \leq 55°C$	700 mW
Video DC Output Current		T_J, Junction Temperature	125°C
I_Q, Positive (Pin 12)	5 mA	T_A, Ambient Temperature Range	−25°C to +70°C
I_Q, Positive (Pin 12)	30 mA	t_{STG}, Storage Temperature Range	−25°C to +125°C
I_Q, Negative (Pin 11)	5 mA		
I_Q, Negative (Pin 11)	30 mA	**Thermal Resistance**	
V_W, White Level Control (R_W) (Pin 10)	−1 to +3V	R_{thJA}, Junction Ambient	100°C/W Max

Electrical Characteristics

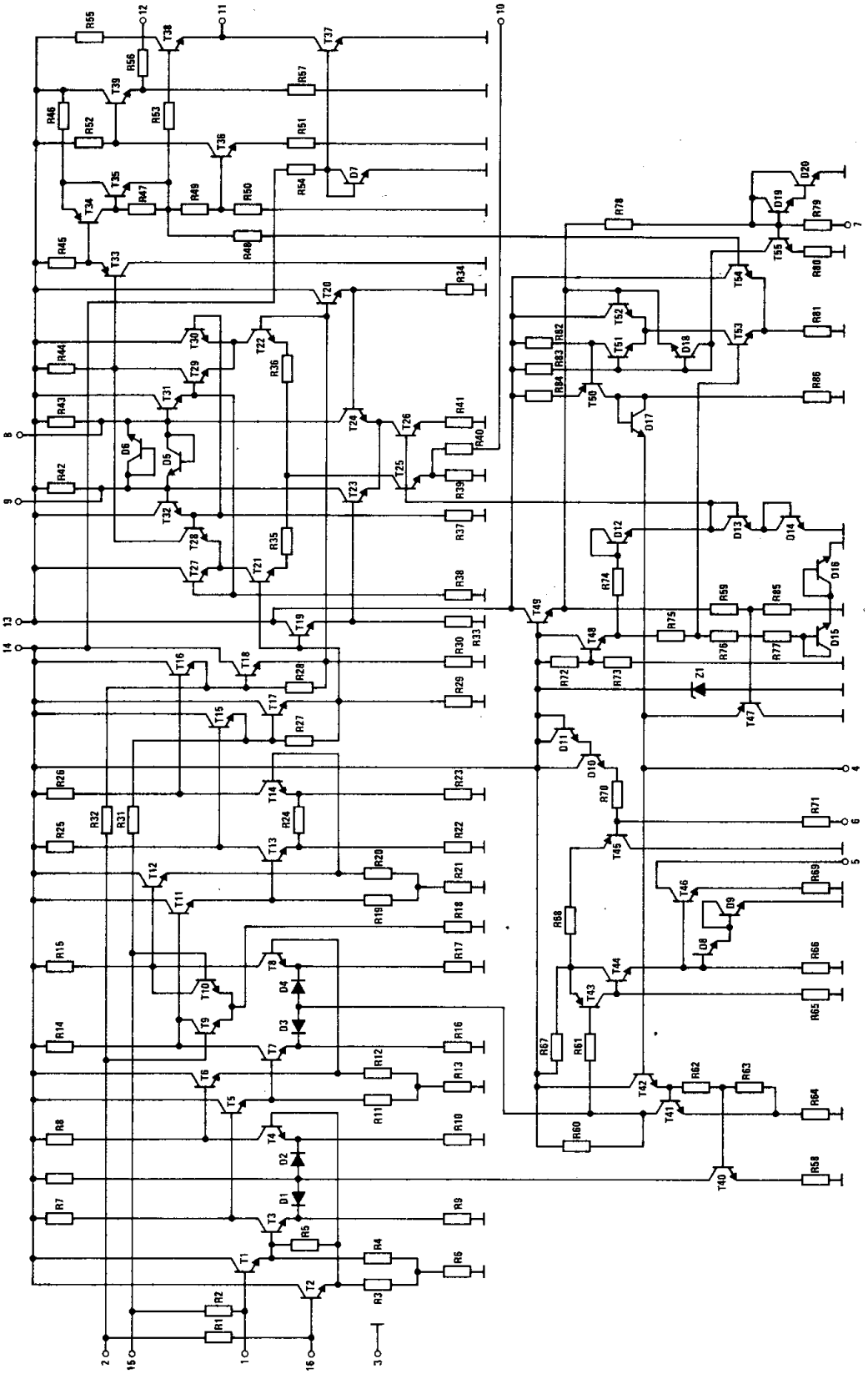
V_S = 12V, T_A = 25°C, Reference point pin 3 unless otherwise specified

	PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
V_S	Supply Voltage	Pin 13	10	12	15	V
I_S	Supply Current	Pin 13	15	19	25	mA
V_S	Supply Voltage	Pin 14, I_S = 40 mA	5.5	5.8	6.4	V
V_Q	Negative Video DC Output Voltage	Pin 11		5.5		V
V_Q	With White Level Adjustable	Pins 10 and 11, $R_W = \infty$			4.8	V
		R_W = 0	6.5			V
V_Q	Peak Black Clamping Level for Negative Video DC Output Voltage	Pin 11	1.75	1.9	2.15	V
I_Q	Output DC Current Reference Point	Pins 11 and 13		3.2		mA
V_Q	Positive Video DC Output Voltage	Pin 12		5.6		V
I_Q	Available Tuner Control Current 10 dB after Onset of Tuner Control Action (Note 1)	Pin 5	3	4.5		mA
V_i	Negative Gating Pulse	Pin 7	1.5	3	5	V_{SS}
$-v_q$	Composite Video Output Level	Pin 11				
		V_Q = 5.5V		3.3		V_{SS}
		V_Q = 6.4V		4.2		V_{SS}
$\Delta A_{(IF)}$	AGC Range		50	56		dB
B_{VIDEO}	Video Bandwidth	Δv_{VIDEO} = −3 dB	8	10		MHz
Δv_{VIDEO}	Video Frequency Response Change	$\Delta A_{(IF)}$ = 50 dB, B_{VIDEO} = 0–5 MHz		1.0	2.0	dB
v_i	Symmetrical Input Voltage	Pins 1–16, $-v_q$ = 3.3 V_{SS} (Pin 11)	100	150	220	μV
	Maximum IF Voltage Level Present at Video Outputs Over the Full AGC Range	Pins 11 and 12				
		f = 38.9 MHz			30	mV
		f = 77.8 MHz (2. Harm)			50	mV
	Sound IF Voltage Level Present at Video Outputs with Selective Circuit	Pin 12, f = 5.5 MHz, B_T/T_T = 30 dB	30			mV
d	Differential Gain of Negative Comp. Video Output Signal, for Full Black to White Swing				15	%
a_{IM}	Suppression of Sound Carrier/ Color Subcarrier IP (1.07 MHz) with Respect to Color Subcarrier Level		40			dB
	Picture Carrier			0		dB
	IF Color Subcarrier Level			−6		dB
	IF Sound Carrier Level			−24		dB
	Input Impedance Reference Point	Pin 16				
R_i	$A_{(IF)}$ Max	Pin 1		1.4		kΩ
C_i				2		pF
R_i	$A_{(IF)}$ Min	Pin 1		1.4		kΩ
C_i				1.9		pF

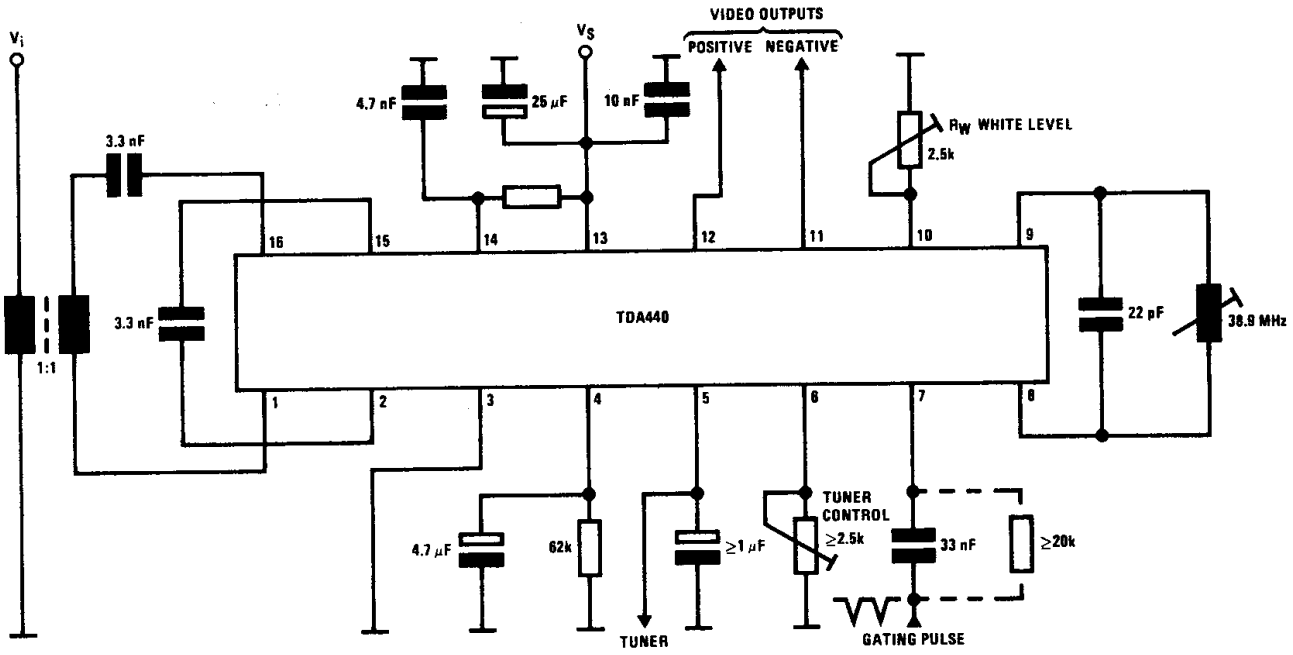
Note 1: On request ≥ 7 mA

Schematic Diagram

Application Note for Reference Circuit to Improve
Audio Interference and Cross Color Characteristics



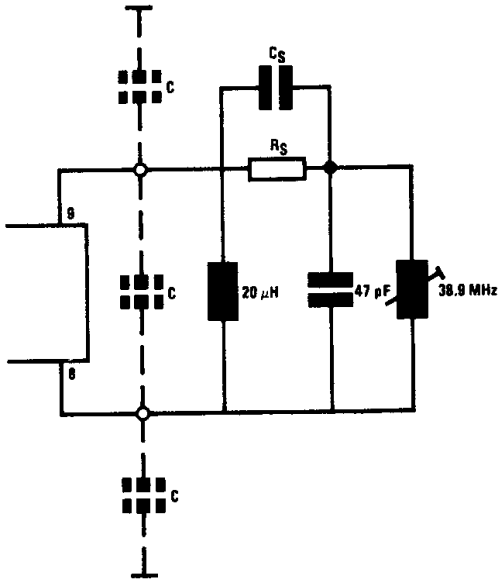
Test Circuit



Note. Supply voltage *must be disconnected* before inserting the integrated circuit in the socket.

Typical Application

Improved Tank Circuit to Reduce Audio Interference and Chroma Beat



C = Parasitic capacitance at pins 8 and 9 should be kept minimum

C_S = 6–10 pF -- series capacitance

f_o = 38.9–(1.8–2.75) MHz–series resonance frequency

R_S = 1.8–3.3 kΩ -- series resonance damping determine the tuning characteristics

i.e., R_S = 2.4 kΩ tuning range, f = 3 MHz